

I/WE CLAIM

1. A vending machine comprising:

a cabinet frame including top, bottom, side and rear walls that collectively define a central cavity;

a plurality of column walls defining a plurality of stack areas for receiving product containers to be selectively dispensed from the vending machine;

a door pivotally mounted to the cabinet frame, said door adapted to selectively close the central cavity;

a delivery chute for receiving a product container dispensed from the vending machine;

a vend motor for selectively delivering one of the plurality of containers from one of the plurality of columns to the delivery chute;

a control unit for selectively activating the vend motor for a vend operation; and

a vend sensor electrically connected to the control unit, said vend sensor including first and second sound elements mounted in the container delivery chute between which pass a sound beam wherein, during the vend operation, one of the plurality of product containers passes between the first and second sound elements and disrupts the sound beam which is signaled to the control unit to complete the vend operation.

2. The vending machine according to claim 1, wherein the first sound element is a speaker and the second sound element is a microphone.

3. The vending machine according to claim 2, wherein the speaker emits the sound beam, said sound beam having an ultrasonic wavelength.
4. The vending machine according to claim 3, wherein the ultrasonic wavelength has a center frequency of approximately 40 KHz.
5. The vending machine according to claim 2, wherein each of the speaker and the microphone are positioned in respective cones, said cones causing the sound beam to be focused between the first and second sound elements.
6. The vending machine according to claim 5, wherein each of said cones includes an angled face portion that aligns the speaker with the microphone.
7. The vending machine according to claim 6, wherein each of said cones include first and second positioning ears mounted to the angled face portion, said positioning ears, in cooperation with the angled face portion orient each of said cones to the delivery chute.
8. The vending machine according to claim 5, wherein each of said cones includes a mounting bracket that secures said cones to the delivery chute.
9. The vending machine according to claim 5, wherein each of said cones includes a notch that focuses the sound beam between the first and second sound elements.

10. The vending machine according to claim 2, wherein the control unit includes a sensor electronic control board for processing a signal from the vend sensor.
11. The vending machine according to claim 10, wherein the sensor electronic control board includes an amplitude detector and a phase detector for detecting a change in the sound beam.
12. The vending machine according to claim 11, wherein the control unit completes the vend operation if a period of the signal from the vend sensor changes.
13. The vending machine according to claim 11, wherein the control unit completes the vend operation if the signal from the vend sensor is below a predetermined threshold value.
14. The vending machine according to claim 13, wherein the control unit completes the vend operation if the signal from the vend sensor is not periodic.
15. The vending machine according to claim 2, wherein each of the speaker and microphone are water resistant.
16. A method of performing a vend operation in a vending machine comprising:
 - selecting one of a plurality of products through manipulation of a control element on the vending machine;

activating a vend motor to deliver the selected product from one of a plurality of product stack areas to a dispensing portion of the vending machine;

guiding the selected product to a product delivery chute; and

signaling a main controller of the vend operation by directing the selected product passed first and second sound elements between which pass a sound beam, wherein disruption of the sound beam signals a completion of the vend operation.

17. The method of claim 16, further comprising: detecting a disruption of the sound beam in the absence of a selected vend operation wherein said disruption indicates that a product is being removed from the machine without payment.

18. The method of claim 16, wherein the sound beam that passes between the first and second sound elements is an ultrasonic sound beam.

19. The method of claim 16, further comprising: focusing the sound beam through respective cone members provided as part of the first and second sound elements.

20. The method of claim 16, further comprising: amplifying the sound beam.

21. The method of claim 20, further comprising:

sensing a magnitude of the sound beam passing between the first and second sound elements; and

signaling the main controller of the vend operation if the magnitude of the amplified sound beam passing between the first and second sound elements is below the predetermined level.

22. The method of claim 20, further comprising:

sensing whether the sound beam passing between the first and second sound elements is periodic; and

signaling the main controller of the vend operation if the sound beam passing between the first and second sound elements is not periodic.

23. The method of claim 16, further comprising:

sensing whether the sound beam passing between the first and second sound elements is periodic; and

signaling the main controller of the vend operation if the sound beam passing between the first and second sound elements is not periodic.